



## **CLEARWATER FISH HATCHERY BROOD YEAR REPORT**

### **BROOD YEAR 1998 CHINOOK and BROOD YEAR 1999 STEELHEAD**



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## 1998 CHINOOK BROOD YEAR REPORT

### ABSTRACT

#### Clearwater

Spring chinook salmon *Oncorhynchus tshawytscha* are reared at Clearwater Fish Hatchery (CFH), and are typically brought on-station as either green or eyed eggs. Chinook were reared on-station and released as pre-smolts or smolts.

#### Powell

Two adult traps were operated in the Lochsa basin. The Crooked Fork trap was installed on June 17, 1998, but because of high water, was not operational until June 28, 1998. The trap was taken out of operation on September 15, 1998.

The Walton Creek weir was installed on June 2, 1998 and taken out of operation on September 15, 1998. The run total for both traps was 541 fish, which included 1 jack, 266 adult males, 248 adult females, and 26 unknowns. A total of 43 fish were released to spawn naturally. All remaining fish were held for spawning. A total of 226 females were spawned, producing 897,993 green eggs.

A total of 293,522 full-term smolts from Powell stock chinook were released from Powell pond from April 10 through April 13, 2000.

#### South Fork (Red River / Crooked River)

Adults returning to Crooked River and Red River weirs were combined into one South Fork stock starting in 1997. Starting with BY-98, chinook stocks from Powell were used to backfill the South Fork populations. Stocks were combined due to being adjacent to each other and a high rate of straying into either drainage. The integrity of all supplementation and natural fish were maintained in their native streams.

The Red River weir was installed on June 10, 1998 and taken out of operation on September 15, 1998. The run total of 90 fish was combined with the returning adults from Crooked River. A total of 36 chinook were released to spawn naturally.

The Crooked River weir was installed June 1, 1998 and taken out of operation September 15, 1998. The run total of 277 fish was combined with returning adults from Red River. A total of 79 chinook were released to spawn naturally.

The South Fork had a run total of 367 fish. A total of 115 fish were released to spawn naturally. All remaining fish were held for spawning. A total of 84 females were spawned, producing 330,054 green eggs.

A total of 74,981 pre-smolts from the Powell stock were released from the Red River pond September 27, 1999.

A total of 159,051 full-term smolts from the South Fork and Powell stocks were released from the Red River pond April 10 through April 14, 2000.

A total of 89,299 pre-smolts from the Powell stock were released from the Crooked River raceways September 28, 1999.

A total of 180,170 low BKD full-term smolts from South Fork and Powell stocks were released from Crooked River raceways April 10 through April 12, 2000. A total of 215,890 high BKD full-term smolts from the South Fork, Powell, and Dworshak stocks were released from Crooked River raceways on April 14, 2000.

## **Rapid River**

During the 1998 spawning season eyed eggs from 118 females from Rapid River stock were transferred to CFH. A total of 510,226 Rapid River stock eyed-eggs were received, all high BKD parentage.

A total of 462,949 high BKD full-term smolts from Rapid River stock were direct released at Rapid River March 6 through March 10, 2000.

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## **INTRODUCTION**

### **Funding Source**

Construction responsibility for the Lower Snake River Compensation Plan (LSRCP) was assigned to the Walla Walla District, Army Corps of Engineers (USACE), while responsibility for fish hatchery Operation and Maintenance (O&M) funding was to be accomplished by "one of the Federal fishery agencies". The USACE, National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (USFWS) settled the question of O&M funding in 1977 with the signing of an interagency agreement. The agreement stated that the USFWS would budget for and administer O&M funding for LSRCP fish hatchery programs (responsibility for administration and O&M for fish passage and wildlife programs remains with the USACE).

The USACE estimated cost for construction of CFH and three satellite facilities was to be \$43,153,000 (Joe McMichael's report December 1991).

### **Location**

Clearwater Fish Hatchery is on the north bank of the North Fork of the Clearwater River, 1.5 miles downstream from Dworshak Dam, 72.5 river miles upstream from Lower Granite Dam, and 504 river miles upstream from the mouth of the Columbia River.

Crooked River satellite facility is 20 miles downstream of Red River. The trap is one-half mile upstream of the mouth of Crooked River, a tributary of the South Fork of the Clearwater River. The juvenile rearing ponds are ten miles upstream from the Crooked River adult trap. Crooked River is 172.5 river miles upstream from Lower Granite Dam, and 604 river miles upstream from the mouth of the Columbia River.

Powell satellite facility is 122 river miles east of CFH at the headwaters of the Lochsa River. Missoula, Montana is the closest town, which is 45 miles east. Powell is 192.5 river miles upstream from Lower Granite Dam, and 624 river miles upstream from the mouth of the Columbia River.

Red River satellite facility is 15 miles east of Elk City, Idaho, 186 river miles upstream from Lower Granite Dam, and 618 miles from the mouth of the Columbia River.

## **OBJECTIVES**

### **Mitigation Goals**

The LSRCP goal for CFH and its satellite facilities is to return 12,000 adult salmon and 14,000 adult steelhead above Lower Granite Dam.



## Idaho Department of Fish and Game Objectives

The objectives of Idaho Department of Fish and Game (Department) for CFH are to reestablish historic fish runs into the upper Clearwater River tributaries; to enhance the wild spawning population; and to increase sport and tribal fishing opportunities.

## **FACILITY DESCRIPTION**

### **General Hatchery Description**

#### **Clearwater Hatchery**

Clearwater Fish Hatchery is the final facility built by the USACE under the LSRCP. This facility is also the largest of the LSRCP hatcheries built.

The hatchery office building consists of two parts. The dormitory section includes four bunkrooms with maximum capacity of 16 people, a living room, dining room, kitchen, shower rooms, and laundry room. The administration portion consists of office space with a visitor center and entry lobby.

The shop area includes a vehicle maintenance shop, a smaller mechanical repair shop, wood shop, and locker room.

The hatchery building also houses an incubation room and walk-in freezer. A screen and equipment storage building is located at the west end of the hatchery.

There are seven residences on the hatchery grounds. Each residence also has a storage building.

Isolation incubation building is used for receiving eggs with unknown disease status and a chemical storage building for storing barrels of formalin and chlorine.

Two 1.8-mile long pipelines run upstream to the Dworshak Dam. The pipelines go up the face of the dam to an elevation of 1,357 feet, then through the dam into the reservoir. The 18-inch pipe (secondary supply) is stationary at an elevation of 1,357 ft with a screened inlet to keep out debris. This pipe supplies cool water to the hatchery. The 48-inch flexible plastic pipe is suspended from a floating platform with a winch attached to the platform. A winch raises and lowers the intake of the pipe to the level of desired water temperature. This pipe supplies warm water (50°F to 58°F) to the hatchery.

Approximately 200 yards upstream from the hatchery is a distribution structure designed to reduce the 286 psi of the high-pressure supply lines to the gravity flow of seven psi to the hatchery. The structure consists of a primary and secondary chamber. Each chamber has two ported sleeve valves used to reduce the pressure. One valve is in operation while the other is on standby for emergencies.

A 73,600 cu ft cleaning sedimentation pond is used during cleaning to settle out the settleable solids produced by the hatchery. A 414,000 cu ft final sedimentation pond settles waste from the total flow of hatchery operation and the outflow of the cleaning sediment.

## **Crooked River**

There are two separate sites to this facility. The first is the adult trap and a support cabin located one-half mile upstream of the mouth of Crooked River. The weir at this location consists of removable posts and panels supported by an iron bridge across Crooked River. There are no holding ponds at the site, and all fish are either released directly from the trap or transported to Red River holding ponds.

Ten miles upstream from the adult trap are two raceways for summer rearing and spring acclimation of smolts. There is a cleaning waste pond and final settling pond to meet EPA water quality standards. Additional facilities include a garage, shop, walk-in freezer to store fish food, and a support cabin with kitchen, dining room, living room, bathroom, and bedroom.

## **Powell**

The Powell facility is located at the confluence of Crooked Fork Creek and Colt Killed Creek (White Sands), which form the Lochsa River. There is one rearing pond for summer rearing and spring acclimation of smolts. A water supply diversion and intake screen structure are on Walton Creek, and a pump house on Colt Killed Creek. A weir diverts fish that come up into Walton Creek into the fish ladder and fish trap. The fish trap is connected to two adult holding ponds and covered spawning area. A floating weir that spans across the Lochsa River is stored at the facility for use when needed. Also on site is a support cabin with a kitchen, dining room, living room, bedroom, bathroom, and walk-in freezer to store fish feed. During the summer of 1994 the USACE constructed a 16-ft x 14-ft formalin storage building.

## **Red River**

The Red River facility consists of four structures. A freezer/storage building which houses a walk-in-freezer, a work shop/garage area, a formalin storage building, and a support cabin.

The adult holding facility consists of two raceways with a holding capacity of 350 adult fish. A removable tripod and panel weir blocks fish passage across Red River and diverts them into the fish ladder.

There is one rearing pond for summer rearing and spring acclimation of smolts. This pond has a hypalon plastic liner with eight- to ten-inch diameter cobblestones on the inclined banks. The bottom of the pond is a bare liner, which aids in pond vacuuming.

## **Production Capacities by Unit**

### **Clearwater Hatchery**

The steelhead raceways consist of 300-ft x 10-ft x 6-ft deep raceways supplied by a center head raceway with an east and west bank of 12 raceways each. The total rearing space of 24 raceways is 216,000 cubic feet (cu ft). This area will rear a maximum capacity of 2.4 million steelhead smolts with 0.3 density index (DI) (Piper 1986). A flow of approximately 1.67 cubic feet per second (cfs) is available for each raceway, but this flow will only allow 1.7 million steelhead to be reared in these raceways without exceeding the flow index (FI) of 1.2 (Piper). All water for these raceways flows through degassing towers then into the head raceway. These raceways are supplied with water from both intakes.

Chinook raceways are 200-ft x 10-ft x 3-ft deep. Eleven raceways have a total rearing space of 66,000 cu ft. The raceways are supplied with water from both primary and secondary intakes and a mixing chamber, which allows for the control of water temperature to rear chinook. The designed rearing capacity of these raceways is 1.5 million smolts at a 0.3 DI (Piper). The estimated flow per raceway is 2.4 cfs per raceway.

The adult holding facility consists of two ponds with a combined capacity of 8,000 cu ft and a maximum holding capacity of 800 adult salmon. There is also a covered spawning area with two live wells for on-site egg taking. This facility is supplied with water from the tailrace of the juvenile chinook raceways. Estimated flow per pond is 3.5 cfs.

The incubation room contains 40 double-stack Heath incubators with a total of 640 trays available for egg incubation. The upper and lower half of each stack (eight trays each) has a different water supply and drain. This design aids in segregation of diseased eggs. The maximum capacity of this facility is five million green eggs. The incubation room is supplied with both water sources to provide the desired temperature for incubation with a flow of 5 to 8 gpm per one-half stack.

Isolation incubation consists of 12 double-stack Heath Incubators with a total of 192 trays available for egg incubation. The maximum capacity of this facility is 1.5 million green eggs. The isolation incubation room is supplied with both water sources to provide the desired temperature for incubation with a flow of 5 to 8 gallons per minute (gpm) per stack.

Early rearing consists of sixty concrete vats. Each measures 40-ft x 4-ft x 3-ft deep and contains 480 cu ft of rearing space. This part of the facility can rear 5.9 million fish to 287 fish/lb at a 0.3 DI. The vats are supplied with water from each intake and have a flow of approximately 120 gpm per vat when all vats are in use. An incubation jar plumbed directly into them. The 60 incubator jars have a total capacity of 2.6 million eggs with a flow of 15 gpm per jar.

## **Crooked River**

The Crooked River acclimation facility has two raceways, measuring 145-ft x 20-ft x 4-ft deep, for a total of 23,200 cu ft. These raceways have a capacity of 700,000 juvenile chinook with a DI of 0.29. Water flow per raceway is 6 cfs. Each raceway is outfitted with three automatic Nielson feeders. The adult trapping facility measures 10-ft x 12-ft x 4-ft deep with a total of 480 cu ft. Water flow for the adult facility is 10 cfs. This facility has no provision for adult holding.

## **Powell**

The rearing pond measures 165-ft x 65-ft x 5-ft deep and has 53,625 cu ft of rearing space. The normal loading of 320,000 fish produces the best looking smolts and a DI significantly less than 0.3. The maximum design capacity is 500,000 fish with a DI of 0.092. Water flow through this pond is 6.24 cfs. A catwalk across the length of the pond supports eight automated Nielson feeders.

The two adult ponds, measuring 100-ft x 20-ft x 4-ft 8 in. deep, have a volume of 9,500 cu ft and a holding capacity of 960 adult chinook. The adult trap measures 12-ft x 6-ft x 4-ft deep and is supplied with 6.24 cfs of water.

## **Red River**

The adult holding facility consists of two ponds, measuring 10-ft x 45-ft x 4-ft deep, with a total of 3,400 cu ft of holding space and a trap area 8-ft x 16-ft x 4-ft deep. These ponds have a holding capacity of 350 fish. A removable tripod and panel weir blocks fish passage and diverts them into the fish ladder. One-half of the weir consists of floating panels and the other half is removable tripods and panels. Water flow through the ponds is 4.09 cfs.

A 170-ft x 70-ft x 4-ft 6-inch deep rearing pond will rear a maximum of 320,000 chinook smolts. The maximum design capacity is 500,000 fish with a DI of 0.092. Maximum water flow through this pond is 6.24 cfs. This pond has a hypalon plastic liner with eight- to ten-inch diameter cobblestones on the inclined banks. The bottom of the pond is a bare liner, which aids in pond vacuuming. A catwalk runs the entire length of the rearing pond and holds eight automatic Nielson feeders.

## **WATER SUPPLY**

### **Clearwater**

Clearwater Fish Hatchery receives water through two supply pipelines from Dworshak Reservoir. The warmwater intake is attached to a floating platform and can be adjusted from five feet to forty feet below the surface. The cool water intake is stationary at 245 ft below the top of the dam. An estimated 10 cfs of water is provided by the cool water supply and 70 cfs of water from the warmwater supply. The cool water supply has remained fairly constant between 38°F and 45°F. The warm water can reach 80°F but is adjusted regularly to maintain 56°F for as long as possible throughout the year. When water temperatures drop in the fall, the intake will be moved to the warmest water available until water temperatures rise in the spring (Appendices A1 and A2). All water is gravity flow to the hatchery.

### **Crooked River**

Crooked River rearing raceways are supplied by an intake 200 yards upstream of the raceways at Crooked River. The water rights stipulate 10 cfs from April 1 to June 30 and six cfs from July 1 to October 1 at the rearing facility. Temperatures ranged from 42°F to 64°F (Appendix B1). All temperatures were taken at the adult trap. All water supplied to both facilities is gravity flow.

### **Powell**

The intake is 100 yards upstream from the facility. Powell's water right for the gravity intake is 6.24 cfs from a gravity-flow system on Walton Creek, and 2.5 cfs from a supply pumped out of Colt Killed Creek. Two 7.5 hp pumps can be used to supply Walton Creek with water from Colt Killed Creek during periods of low water. Water temperatures ranged from 43°F to 58°F from Walton Creek (Appendix B2).

### **Red River**

Red River is supplied by gravity flow from an intake at the bottom of the South Fork of Red River, 225 yards upstream from the facility. The water right for the facility is 8.18 cfs. During low flow in the summer, about five cfs is available to the hatchery. Temperatures ranged from 42°F to 65°F (Appendix B3).

## **Water Quality Analysis**

The water quality analysis at CFH was done by the State of Idaho, Department of Health and Welfare in Boise, and the satellite facilities were done by Anatek Labs in Moscow, Idaho.

The samples were taken from the hatchery incubation supply line July 1994 (Appendix C1).

Clearwater Hatchery water supply has a total alkalinity (as  $\text{CaCO}_3$ ) of 16 mg/l, which is very low regarding fish culture.

Water quality analysis was taken at Crooked River, Powell and Red River rearing facilities from the intake in 1998 (Appendix C2, C3 and C4).

## **STAFFING**

Clearwater Fish Hatchery has eight permanent staff employees. These include one Hatchery Manager, two Assistant Hatchery Managers, one Utility Craftsman, three Fish Culturists, and an Office Specialist II. The rest of the crew consists of temporary employees with positions of Fishery Technicians, Biological Aides, Laborers, Mechanic's Assistant, Grounds Maintenance Worker, and Clearwater Youth Program enrollees. Three temporary employees staff the Red River, Crooked River, and Powell facilities, which are supervised from CFH.

## **ADULT CHINOOK COLLECTION**

### **South Fork of the Clearwater River**

The Crooked River and Red River production population was combined beginning in 1997. Trapping protocols for the South Fork trap included ponding all adipose (Ad) clipped fish and releasing all ventral clipped fish and unmarked fish above the trap.

All right ventral (RV) five-year-old chinook were released above Crooked River trap and all four-year-old RV-clipped fish and five-year-old left ventral (LV) clipped fish were released above the Red River trap no matter where they were trapped. All unmarked chinook were released above the trap where they were captured. In the past all chinook were held until first sort. This year a decision was made to release at time of trapping, therefore many fish were released with unknown sex identification.

The Crooked River weir and trap was in operation between June 1 and 15, 1998. A total of 277 fish (all adults) were trapped.

The Red River trap was installed on June 10, 1998 and taken out of operation on September 15, 1998. A total of 90 fish (2 jacks and 88 adults) were trapped.

Age-class breakdown of this run included: two 1-ocean males (<64 cm), eight 2-ocean males, 29 2-ocean females, and 21 2-ocean unknowns (64-82 cm), 132 3-ocean males, 84 3-ocean males, and 91 3-ocean unknowns (83+ cm) (Appendices D1, D2, E1, E2, F1, and F2).

## **Powell**

During 1998, two adult traps were installed in the Lochsa basin. A picket weir was installed on Crooked Fork Creek approximately one mile upstream of twin bridges. This was an effort to reduce hatchery straying in that basin.

The trap on Walton Creek was installed on June 2, 1998 and taken out of operation on September 15, 1998. The Crooked Fork trap was installed on June 28 and taken out of operation on September 15, 1998. A total of 541 fish (1 jack and 540 adults) were trapped.

Trapping protocols for the Powell trap included ponding all Ad-clipped fish and opercle punching and releasing all ventral-clipped and unmarked fish back into the Lochsa. All opercle-punched fish that returned to the trap were ponded for production. Trapping protocols for the Crooked Fork trap included transporting and ponding all Ad-clipped fish at Powell for production. All ventral clipped fish were released below the trap and all naturals / wild fish were released upstream.

Age-class breakdown of this run included: One 1-ocean male (<64 cm), 75 2-ocean males, 106 2-ocean females, and 7 2-ocean unknowns (64–82 cm), 191 3-ocean males, 142 3-ocean females, and 19 3-ocean unknowns (83+ cm) (Appendices G1, G2, G3, and H).

## **ADULT HOLDING**

All the South Fork production chinook were held at Red River and the Lochsa production fish were held at Powell.

All fish were injected with Erythromycin 200 at a rate of 20 mg/kg at trapping to inhibit BKD. Fish were treated with a formalin drip for one hour every other day to prevent fungal growth. Fish held at Red River were treated at 150 ppm, and fish at Powell were treated at 120 ppm. After sorting, fish were treated daily at the same concentration and duration until all females were spawned.

## **SPAWNING AND EGG TRANSPORT**

At Powell a 1:1 male/female spawning ratio was used (CFH genetics protocol for more than 100 females) and on the South Fork, a 2:1 male/female-spawning ratio was used (CFH genetics protocol for 50 to 100 females).

At each facility, eggs were placed in egg tubes and coolers with 100-ppm iodine solution for one hour. After water hardening, water was drained and green eggs were placed in fresh water and transported to CFH for incubation. The transport vehicle was met at the front gate and egg tubes were removed from transport coolers and placed in clean egg coolers containing tempered 100-ppm Argentyne solution for 10 minutes. Then eggs, at one female per tray, were placed in individual Heath egg trays in the incubation room.

Tissue and ovarian samples were collected at the time of spawning. These samples were airmailed the next day to Eagle Fish Health Lab for BKD and virus testing (Appendix I).

### **South Fork of the Clearwater**

Chinook were sorted twice per week for ripeness. The first fish was spawned August 11 and the last on September 4, 1998. A total of 84 females were spawned. Pre-spawn mortality for the South Fork stock, including fish held at the main facility, was 50 fish (13.6% pre-spawning mortality). All pre-spawn carcasses not showing clinical signs of BKD were returned to either Crooked River or Red River to add nutrients to the system (Appendix E2).

### **Powell**

Fish were checked twice per week for ripeness. The first fish was spawned on August 3 and the last on September 8, 1998. A total of 226 females were spawned. Fish carcasses not showing clinical signs of BKD were placed in the Lochsa and tributaries to add nutrients to the stream (Appendix G3). Pre-spawn mortality was 37 fish (6.8% pre-spawn mortality).

### **Eggs Received**

During 1998 spawning season, eyed-eggs from high BKD parentage were received from Rapid River and Dworshak hatcheries. Clearwater Fish Hatchery received a total of 510,226 eyed eggs from 119 females from Rapid River and 151,000 eyed eggs from Dworshak Hatchery (Rapid River stock) (Appendix I).



## **INCUBATION**

### **Clearwater Hatchery**

Green eggs were placed into Heath egg trays with one female's eggs per tray. All Heath stacks were operated at approximately 5.5 gpm.

Females were screened for BKD using Elisa techniques. Females with optical density (OD) over 0.8 were culled. The BKD tests resulted in culling of 36 females at Powell and 18 females from the South Fork or approximately 260,000 green eggs (17.4% of egg take). At Powell, females with OD between 0.25 and 0.79 were highs and on the South Fork, females with OD between 0.40 and 0.79 were highs.

A total of 1,889,273 eggs (1,228,047 green eggs and 661,226 eyed-eggs) were incubated from BY98 spring chinook salmon. Overall development from green eggs to eyed-eggs numbered 1,006,067 for a total eye-up percentage of 81.9%. South Fork achieved 85.5% eye-up, Powell 80.6% eye-up (Appendix I).

Beginning on the third or fourth day of incubation, all egg lots were treated with formalin to reduce fungal development. Treatments were administered three times per week at a 1:600 concentration (1,667-ppm) for 15 minutes and continued until each egg lot accumulated 800 thermal units (TUs).

Eye-up occurred at approximately 500 TUs at which time all egg lots were shocked, then picked and enumerated with an egg picker. Prior to hatching, all eyed-eggs were picked twice weekly. Hatching occurred at approximately 1,000 TUs. Swim-up fry were transferred to the early rearing vats at approximately 1,750 TUs. Survival of green eggs to swim-up fry for the South Fork and Powell averaged 77.7%. Both Dworshak and Rapid River high BKD chinook were received as eyed-eggs (Appendix I).

## **EARLY REARING**

At swim-up, fry were ponded in hatchery vats. Vats were loaded with fry at approximately 24,000 to 46,000 fish per vat. A total of 1,610,934 swim-up fry were ponded into 43 vats. Fish were segregated by stock and by BKD status. Fish were started on feed in a full-length vat with baffles in place. Initial water flows were set at 46 gpm for approximately 10 days to start the fry on feed. Water flows were increased to 92 gpm on day 11 and remained set at that rate until the fish were moved outside. Flow indices were held at or below 1.5 while DI never exceeded 0.3 during the entire early rearing period.

Water temperatures for the early rearing period ranged from 40°F to 56°F (Appendices A1 and A2).

Bio-Oregon starter and BioDiet grower formula were used to feed all lots of fish during early rearing. A total of 20,460 lbs of food was used at a cost of \$18,010. The conversion rate of this period was 1.25 lbs of feed for one lb of gain (Appendix K).

## **FINAL REARING**

Releases from CFH occurred in two different life stages:

Pre-smolt -	164,280
Full term smolt	1,311,582

### **Fall Pre-Smolt**

Summer rearing and release of pre-smolts occurred at Crooked River. Fall rearing and release took place at Red River. Fingerlings were transported to Crooked River on July 16, 1999 (60 fpp), and to Red River on September 8, 1999 (34 fpp).

On September 27, 1999, 74,981 fish were released from Red River acclimation pond. These fish averaged 23 fpp. On September 28, 1999, 89,299 fish were released from upper Crooked River raceway into Crooked River. These fish were 27 fpp (Appendix J).

Conversion rates for these fish were 1.20 at Red River, and 1.59 at Upper Crooked River. Water temperatures for this rearing period ranged from 42°F to 69°F. All rearing units were outfitted with electric bug zappers to add natural feed to the fishes diet. All pre-smolts received one 28-day erythromycin feed treatment prior to release.

### **Full Term Smolt**

All spring chinook salmon reared to full term smolts were raised at the main Clearwater Fish Hatchery. All chinook that were utilized for CFH programs were reared in the chinook bank, and all the Rapid River high BKD fish were reared in the steelhead bank.

Chinook were acclimated for about two weeks at all three satellite rearing ponds in 2000. Smolts were transported to Powell from March 27 through March 29, 2000, Red River on March 30, 31, and April 2, 2000 and to upper Crooked River from March 30 through April 1, 2000. On April 12 screens were removed from all satellite acclimation ponds for volitional release.

Between April 10 and April 13, 2000, 293,522 fish at 10.86 fpp were released from Powell into Walton Creek. Between April 10 and April 14, 159,051 fish at 18.0 fpp were released from Red River. Between April 10 and April 12, 180,170 fish at 19.6 fpp were released from upper Crooked River. On April 14, 215,890 high BKD fish at 18.7 fpp at upper Crooked River. Between March 6 and March 12, 2000, 462,949 fish were released at the adult trap at Rapid River (Appendix J).

Conversion rates for these fish were 1.59 for Powell stock, 1.43 for Red River stock, and 1.42 for Crooked River stock. Water temperatures during this 16-month rearing period ranged from 40°F to 59°F (Appendices A1 and A2). All smolts released at the satellites received two 28-day Erythromycin feed treatments.

Bio-Oregon's BioDiet grower feed was the diet used throughout the final rearing period. A total of 107,184 lbs of fish food was used during final rearing at a cost of \$127,370. Total feed used in early and final rearing was 127,644 lbs at a cost of \$145,380 (a conversion rate of 1.35). Included in this cost is 41,800 lbs of feed purchased by Idaho Power Company (IPC) at an estimated cost of \$35,849. The feed cost estimate was based on Department contract feed prices. Percent body weights fed ranged from 1.0 to 5 pct (Appendix K).

Chinook were fed full rations until June 1999. At that time, all chinook were fed four days on feed and three days off feed, except during medicated feed treatments. All the fish were fed full rations from mid-January until release. This feed regimen was done to slow growth, yet, maintain fin quality, fat reserves, and reduce the necessary manpower to one outside person on weekends. Fin quality and fat reserves remained excellent. The remaining chinook were allocated to the "large size" in the size-at-release study. These three raceways of chinook were fed daily until release. Two separate sizes of fish were maintained for the size-at-release study. The two size groups were normal size smolts (14 to 16 per lb) and large smolts (8 to 9 per lb).

All final rearing raceways were set up with jump screens and floating shade structures (3-4 per pond) to reduce stress and increase available shade to fish. Shade was available over twenty percent of the pond surface.

Water temperatures during the final rearing period were kept as cool as possible to reduce growth rates. Every effort was made to stay below 55°F. Hatchery water temperatures varied from 40°F to 55°F during the final rearing period (Appendices A1 and A2). An estimated 2.2 cfs of water was supplied to each raceway.

## **FISH HEALTH**

The BY98 spring chinook reared at CFH were separated into two groups. The first group was progeny from parents with OD below 0.25 at Powell and 0.4 on the South Fork. These fish were reared as low BKD fish. All the high BKD chinook had an OD  $\leq$  0.8 from Clearwater egg takes and  $<$  1.0 from the Dworshak National Fish Hatchery. All chinook eggs above this OD were culled.

All high BKD chinook were released separately from the low BKD chinook at upper Crooked River.

Chinook received two 28-day Erythromycin medicated feed treatments. All fish were fed Bio-Oregon's feed with 2.25% Aquamycin-100. The fish were fed between 75 and 150 mg Erythromycin per kilogram of fish weight to comply with Investigational New Animal Drug (INAD) specifications.

An estimated 35,000 spring chinook were killed on April 6, 2000. The intake screen for the Powell pond had partially plugged through the night during the acclimation period.

## **PATHOLOGIST REPORT**

Diseases Encountered and Treatment. Brood year 1998 chinook were not challenged by epizootic, by bacterial, viral, or mycotic infectious agents. Two prophylactic treatments of erythromycin-medicated feed were applied to all chinook stocks to reduce the risk of *Renibacterium* producing a BKD outbreak. These feed treatments are allowed via INAD 6013/4333. Pre-liberation sampling shows a low level of *Renibacterium* in all stocks sampled. Brood stock sampling at the Powell and Red River satellites did not find viral replicating agents, but ELISA sampling of kidney tissue did find *Renibacterium*.

Organosomatic Index. See Appendices L1 through L7.

Acute Losses. Neither acute nor chronic losses were experienced at CFH.

Other Assessments. Clearwater Hatchery has been successful in improving, developing, and restoring the anadromous fisheries of the Clearwater River. It would be most helpful if Clearwater could focus on its original mission of sport fishery restoration and not be put into a conservation hatchery mission.

### **Crooked River**

Diseases Encountered and Treatments. No diseases were encountered during acclimation of fall release and spring release juveniles. Viral replicating agents were not found during routine chinook brood fish sampling, but *Renibacterium* was found during ELISA testing.

Organosomatic Index. See Appendices L1 and L2.

Acute losses. Neither acute nor chronic losses were experienced at Crooked River.

### **Powell**

Diseases Encountered and Treatments. No juveniles were reared at this facility. Only spring acclimated fish were released at this facility. Only *Renibacterium* was found in juvenile chinook via ELISA technology. Chinook brood fish were only positive for *Renibacterium* via ELISA technology.

Organosomatic Index. See Appendices L3 and L4.

Acute Losses. Neither acute nor chronic losses were experienced at Powell.

## Red River

Diseases Encountered and Treatment. No diseases were found in fall and spring pre-liberation sampling of chinook. ELISA technology found low optical densities of *Renibacterium* in these chinook juveniles. Chinook brood fish were negative for viral replicating agents, but positive for *Renibacterium* via ELISA technology.

Organosomatic Index. See Appendices L5 and L6.

Acute Losses. Losses due to etiologic agents were not experienced at Red River.

## FISH MARKING

A total of 1,519,188 spring chinook were marked. Marks included: 978,511 Adipose (Ad) clipped; 375,461 Ad-clipped and coded wire tagged (CWT); 89,299 right ventral (RV) clipped and 74,981 left ventral (LV) clipped (Appendix J).

Chinook were marked from early rearing vats (inside) into final rearing raceways (outside). Marking started on May 10 and was completed on June 17, 1999. Fish ranged in size from 129 fpp to 155 fpp. A total of 901 fish were Passive Integrated Transponder (PIT) tagged.

## FISH DISTRIBUTION

Releases from CFH occurred in two different life stages:

Pre-smolt	164,280
Full term smolt	1,311,582

## Fall Pre-Smolt

## Crooked River

A total of 89,299 fish (27.0 fpp) were released into Crooked River on September 28, 1999. All pre-smolts were RV-clipped, no fish were CWT, or PIT-tagged (Appendix J).

## **Red River**

A total of 74,981 fish (23 fpp) were released into Red River on September 27, 1999. All pre-smolts were LV-clipped, no fish were CWT, or PIT-tagged (Appendix J).

## **Full Term Smolt**

## **Powell**

A total of 293,522 smolts (10.86 fpp) were released into Walton Creek. Smolts were transported to Powell March 27 through March 29, 2000. After approximately two weeks of acclimation, fish were released volitionally on April 10, 2000. On April 13, 2000 the pond was drained and all remaining smolts were released from the pond. All smolts were Ad-clipped and CWT-tagged, and 301 fish carried PIT-tags.

## **Red River**

A total of 159,051 smolts (18.0 fpp) were released into Red River. Smolts were transported to Red River March 29 and March 30, 2000. Fish were released volitionally on April 10. On April 14, 2000 the pond was drained and all remaining smolts were released. All smolts were Ad-clipped, 23K were CWT-tagged, and 300 fish carried PIT-tags.

## **Crooked River**

A total of 396,060 smolts (19.1 fpp) were released into Crooked River. Smolts were transported to Crooked River March 29 through March 31, 2000. Low BKD fish were released volitionally on April 10. On April 12 the pond was drained and all remaining smolts were released. The high BKD chinook were directly released (not volitionally) on April 14, 2000. All smolts were Ad-clipped, 22.5K were CWT-tagged (low BKD), and 300 fish carried PIT-tags (low BKD).

## **Rapid River**

A total of 462,949 high BKD smolts (15.1 fpp) were direct released into Rapid River from March 6 through March 10, 2000. All smolts were Ad-clipped only.

## **BROOD YEAR 1999 STEELHEAD REPORT**

### **ABSTRACT**

Clearwater Fish Hatchery (CFH) received 889,200 eyed BY-99 North Fork B-run steelhead eggs from Dworshak National Fish Hatchery (DNFH). A total of 735,266 smolts from the North Fork stock were released from April 19 through May 4, 2000; 311,416 at Red House hole, 183,857 at Kooskia Hatchery on Clear Creek, 139,662 at Red River, and 100,331 at Crooked River. The size of fish at release for the one-year rearing cycle was 4.8 fpp, for a total of 153,257 pounds and average length was 218mm. An additional 43,087 fish were transferred back to DNFH on August 3, 1999. The size of fish at transfer was 100 fpp, for a total of 431 pounds.

A total of 204,104 pounds of feed was fed with a cost of \$78,924 to produce 153,702 lbs of fish at CFH. The conversion rate was 1.32.

Authors:

Brad George  
Assistant Hatchery Manager

Jerry McGehee  
Hatchery Manager

## SYNOPTIC HISTORY

### Clearwater Fish Hatchery

#### *Brood Source*

Dworshak National Fish Hatchery (DNFH) was the source for North Fork stock B-run steelhead eggs.

#### *Disease History*

Dworshak Hatchery has a long history of Infectious Hematopoietic Necrosis Virus (IHNV). Therefore, Clearwater Fish Hatchery (CFH) only accepts steelhead eggs from IHNV-negative females and follows a strict disinfecting protocol when transporting them onto the station.

#### *Spawning*

When eggs were being collected for CFH at DNFH, two of our crew assisted with their spawning operation. We collected and packaged all the disease samples to ship by airmail to Eagle Fish Health Lab.

#### *Incubation*

Eyed steelhead eggs were received from DNFH in four weekly shipments from March 25 through April 16, 1999 (Appendix M). The eggs from DNFH lots six (March 9) through nine (March 30) were incubated approximately 17 days at Dworshak until the eggs eyed-up. All eggs from negative IHNV females were disinfected and transported to CFH. The transport vehicle was met at the front gate and egg baskets were removed from egg coolers and placed in clean egg coolers containing tempered 100-ppm Argentyne solution for 10 minutes. The clean egg coolers were then taken to the incubation room and eggs were placed into Heath egg trays with approximately 7,000 eggs per basket. Water flows through each stack were set at six gallons per minute (gpm). A total of 889,200 eggs were received (Appendix M). During incubation, steelhead eggs were on primary water only.

## EARLY REARING

At swim-up, unfed fry from Dworshak stock B-run steelhead were moved to vats 1 through 13, and 24 through 36 and were divided as evenly as possible (30,000 to 33,000 fish/vat). The initial DI was 0.03 and FI was 0.20. Fish were held in the hatchery vats until August when they were marked and moved to twelve steelhead raceways (1 - 6 east and west). Average length of the fish at the end of early rearing was 3.10 inches (80 mm). The fish averaged 90 fpp.



Water temperatures for the early rearing period ranged from 47°F to 59° F (Appendix A2). Whenever the temperatures exceeded 58°F for more than two days, the water was cooled back down by either blending in more secondary water or by lowering the primary intake in Dworshak Reservoir.

Bio-Oregon's starter and grower, and Moore-Clark Nutra starter feed were used to feed these fish during the early rearing period. A total of 7,639 lbs of feed were used to achieve a feed conversion of 0.94 for a cost of \$7,350 (Appendix K).

## **FINAL REARING**

The juvenile Dworshak stock B-run steelhead were moved to outside steelhead raceways 1 through 6-east and west. During August 1999, the move was done in conjunction with fin clipping and CWT-tagging to avoid double-stressing the fish. Fin clipping was done in eight-hour shifts per day. Baffles were removed from vats and fish were moved to the clipping trailers using the transfer tanks. The Red River and Crooked River fish were not clipped, but were inventoried during the move outside.

The DI of the Dworshak steelhead ranged from 0.20 to 0.22 and the FI ranged from 0.90 to 1.01. These indexes were recalculated biweekly and were never allowed to exceed DI of 0.33 or FI of 1.5.

Water temperatures during final rearing period were maintained to keep temperatures as close to 57°F as possible (Appendix A2). Reservoir water temperatures began to drop in late October and bottomed out in January at 43°F. Temperatures began to slowly increase in late February and had reached 50°F by mid-March. Estimated water flows per raceway were 3.5 cfs.

Fish were fed semi-moist feed two weeks after marking. Semi-moist and dry feeds were mixed for three days before fish were converted to dry feed.

Fish were fed dry feed until released. A total of 196,465 lbs of feed was used during final rearing producing 145,575 lbs of gain at a cost of \$71,574. A total of 204,104 lbs of feed was used throughout the entire rearing period to produce 153,257 lbs of fish at a cost of \$78,924. The overall conversion rate from fry to smolt was 1.32. Percent body weight fed ranged from 0.75% to 12% (Appendix K).

A feed performance test was conducted comparing Bio-Oregon starter and grower feeds to Moore-Clark feed. Feed amounts and cost were included in production costs. A complete report on our findings will be printed at a later date.

## **FISH HEALTH**

Brood year 1999 steelhead were not challenged by epizootics by bacterial, viral, or mycotic infectious agents (Appendix N).

## **FISH MARKING**

North Fork stock steelhead released into the South Fork of the Clearwater River were all Ad-clipped, 65K were CWT-tagged and 300 were PIT-tagged. The Clear Creek release fish were all Ad-clipped, 45K were CWT-tagged and 300 were PIT-tagged. The steelhead released at Red River and Crooked River were unmarked, but 300 fish at each location were PIT-tagged (Appendix O).

## **FISH DISTRIBUTION**

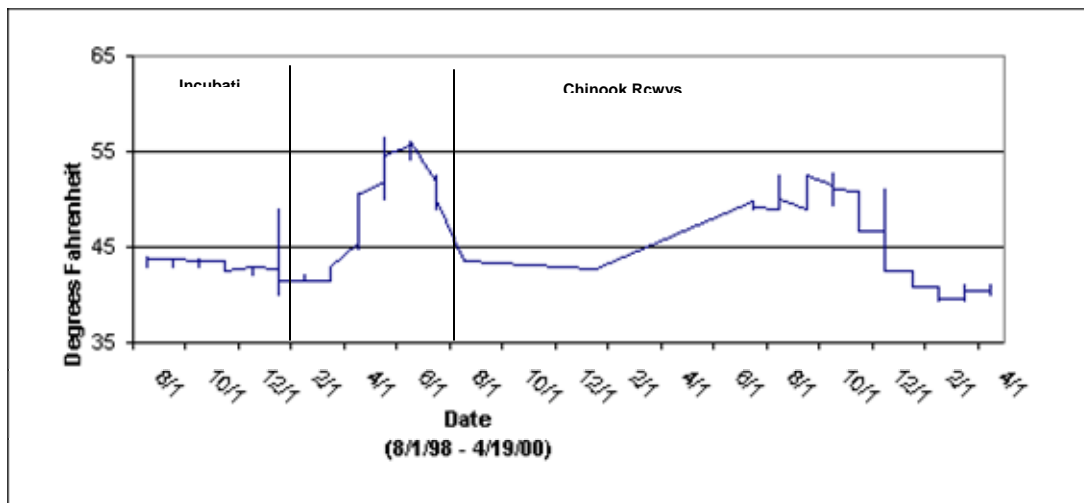
Between April 19 and 21, 2000 a total of 311,416 (4.9 fpp) Dworshak B-run steelhead were direct released at the Red House hole plant site (approximately 3.5 miles upstream of Highway 13 and 14 junction) on the lower South Fork of Clearwater River. Also, 183,857 (4.7 fpp) Dworshak B-run steelhead were direct released into Clear Creek at Kooskia Hatchery between April 19 and 20, 2000. There were 139,662 fish released between April 27 and May 4, 2000 at Red River, which averaged 4.8 fpp, and an additional 100,331 fish were released at Crooked River between April 27 and May 4 which averaged 4.6 fpp. There was very little crowding and hauling mortality from the fish transportation to the release sites (Appendix O).

## **ACKNOWLEDGEMENTS**

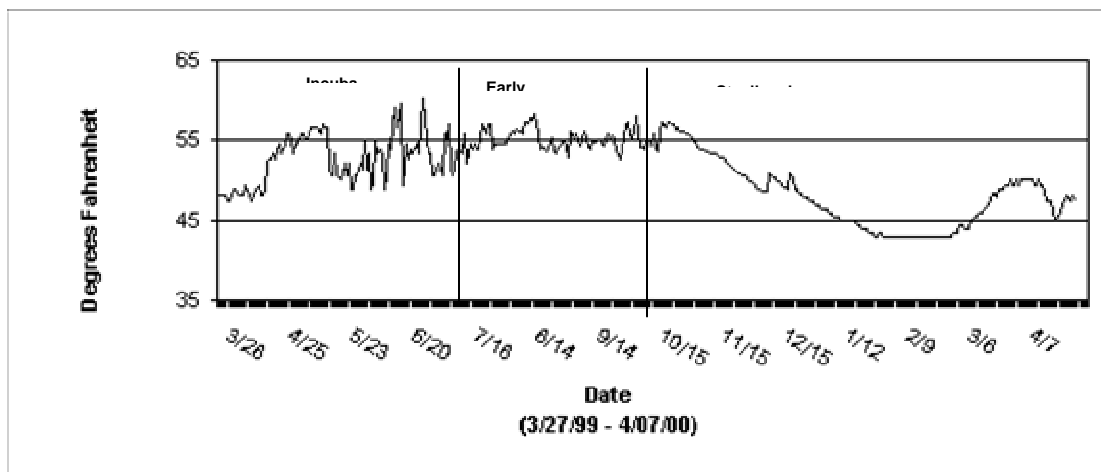
The Clearwater Fish Hatchery has a crew of 22 people who are all assigned a wide variety of responsibilities. Everyone on-station has contributed to the success of the program. The hatchery crew consists of: Jerry McGehee - Hatchery Manager; Brad George and Scott Patterson - Assistant Hatchery Managers, CalLee Davenport, Marc Arms, and Tom Tighe -Fish Culturists; Ernie Yost - Utility Craftsman; Rene'e Hedrick - Office Specialist II; Ric Downing, Chris Shockman, Ron Hopper, and Don West - Fish Technicians; Josh Downing, Stacey Goeckner, Chad Henson, Shane Richards, and Bob Schloss - Bio-aides; Kim West - Grounds Maintenance Worker; and Ben Daly and Eric Tanner - Laborers.

## **APPENDICES**

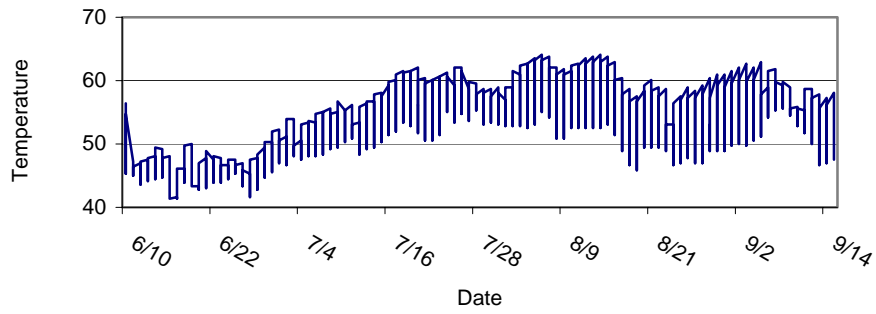
Appendix A1. Brood Year 1998 chinook water temperatures.



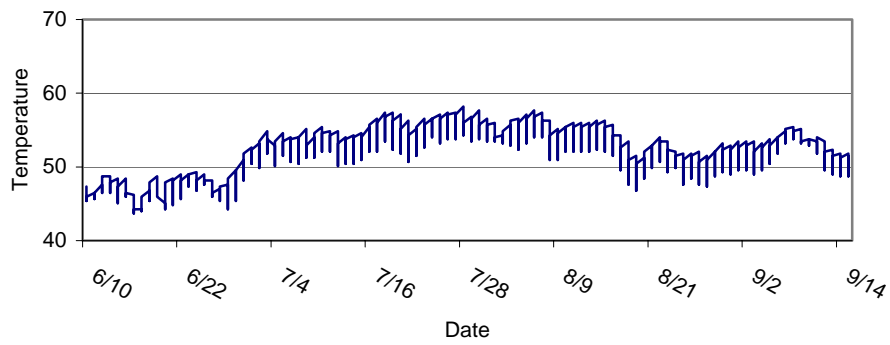
Appendix A2. Brood Year 1999 steelhead water temperatures.



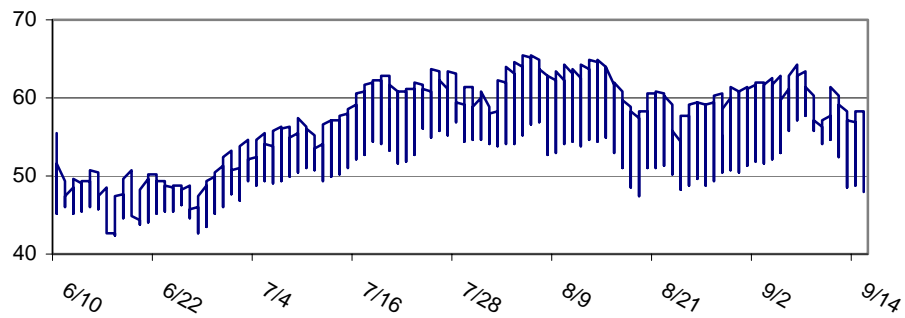
Appendix B1. Crooked River Water Temperatures, 1998



Appendix B2. Powell Water Temperatures, 1998



Appendix B3. Red River Water Temperatures, 1998



Appendix C.1. Clearwater Hatchery water quality analysis taken from the hatchery rearing facility on August 4, 1994.

ANALYSIS	RESULTS (mg/l)	DATE ANALYZED	OPTIMAL REARING LEVELS
Alkalinity	16.0	08/04/94	120 - 400 mg/l
Ammonia (as N)	<0.005	08/04/94	0.0125
Arsenic	<0.01	08/04/94	N/A
Barium	<0.1	08/04/94	N/A
Cadmium	<0.001	08/04/94	<.0004 mg/l
Calcium	3.8	08/12/94	N/A
Chloride	0.9	08/12/94	N/A
Chromium	<0.01	08/04/94	0.1
Color (C.U.)	15	08/12/94	N/A
Copper	<0.02	08/04/94	<.006 mg/l
Cyanide	<0.005	08/12/94	N/A
Detergents (surfactant			
	<0.08	08/09/94	N/A
Fluoride	<0.1	08/30/94	N/A
Hardness	14.0	08/04/94	120 - 400 mg/l
Hydrogen Sulfide	<0.01	08/15/94	N/A
Iron	<0.02	08/11/94	N/A
Lead	<0.005	08/04/94	<.03 mg/l
Magnesium	<0.8	08/11/94	N/A
Manganese	<0.01	08/11/94	N/A
Mercury	<0.0005	08/11/94	<.002 mg/l
Nitrogen Nitrate	<0.013	08/18/94	0.2 mg/l
Potassium	0.5	08/12/94	N/A
Selenium	<0.005	08/10/94	N/A
Silica	11	08/30/94	N/A
Silver	<0.001	08/17/94	N/A
Sodium	1.5	08/17/94	N/A
Sulfate	<1	08/26/94	N/A
Total Dissolved Solids 28		08/11/94	80 mg /l
Zinc	<0.005	08/10/94	0.03 mg/l
pH (pH units)	7.20	08/09/94	6.5 - 8.0

Appendix C2. Upper Crooked River rearing pond water quality analysis report. Analysis done by Anatek Labs, Inc., Moscow, Idaho

PRIMARY CONTAMINANTS

Contaminant	Result	MDL	Method	Analysis Date	Contaminant	Result	MDL	Method	Analysis Date
Antimony (0.006)	- - -	0.001	EPA 200.8	07/02/97	Nickel	- - -	0.001	EPA 200.8	07/02/97
Arsenic (0.05)	ND	0.005	EPA 200.8	07/02/97	Selenium (0.05)	ND	0.005	EPA 200.8	07/02/97
Barium (2)	0.029	0.01	EPA 200.8	07/02/97	Sodium	2.9	1	EPA 200.8	07/02/97
Beryllium (0.004)	- - -	0.001	EPA 200.8	07/02/97	Thallium (0.02)	- - -	0.001	EPA 200.8	07/02/97
Cadmium (0.005)	ND	0.001	EPA 200.8	07/02/97	Cyanide (0.2)	ND	0.01	EPA 200.8	07/02/97
Chromium (0.1)	0.002	0.005	EPA 200.8	07/02/97	Fluoride (4.0)	ND	0.1	EPA 300.0	06/27/97
Mercury (0.002)	ND	0.001	EPA 200.8	07/02/97					

SECONDARY CONTAMINANTS

Contaminant	Result	MDL	Method	Analysis Date	Contaminant	Result	MDL	Method	Analysis Date
Chloride	ND	0.001	EPA 300.0	06/27/97	Ammonia/N	ND	0.1	EPA 350.2	07/01/97
Color	2	0.005	EPA110.2	06/27/97	Calcium	3.6	1	EPA 200.8	07/02/97
Sulfide (HS)	ND	0.01	EPA 376.1	06/27/97	Hardness (CaCO3)	12	5	2340 B	07/02/97
Iron	0.26	0.05	EPA 236.1	07/02/97	Magnesium	0.6	1	EPA 200.8	07/02/97
Manganese	0.01	0.001	EPA 200.8	07/02/97	pH	6.9		EPA 150.1	07/02/97
Odor	- - -	1	EPA 140.1		Potassium	0.15	1	EPA 200.8	06/27/97
Surfactants	ND	0.05	SM5540C	06/27/97	Silica (SiO3)	6.8	1	EPA 200.8	07/02/97
TDS	18	1	EPA 160.1	06/27/97	Lead	0.002	0.001	EPA 200.8	07/02/97
Zinc	0.012	0.001	EPA 200.8	07/02/97	Copper	0.016	0.001	EPA 200.8	07/02/97
Sulfate	ND	1	EPA 300.0	06/27/97	Conductivity (us/cm)	25	10	EPA 120.1	06/27/97
Aluminum	- - -	0.001	EPA 200.8	07/02/97	Langlier Index	- - -			
Alkalinity	12	5	EPA 310.1	06/27/97	Silver	ND	0.01	EPA 200.8	07/02/97
Turbidity (NTU)	- - -	0.5	EPA 180.1						

Laboratory Reporting Codes:

Results are mg/L (ppm) unless otherwise noted

ND - Not detected within the sensitivity of the instrument

- - - = No analysis performed for this contaminant

Numerical Entry = Detection at level indicated

MCL (numbers in parenthesis)= EPA maximum contaminant level



Appendix C3. Powell adult holding pond water quality analysis report.  
Analysis done by Anatek Labs, Inc., Moscow, Idaho.

PRIMARY CONTAMINANTS

Contaminant	Result	MDL	Method	Analysis Date	Contaminant	Result	MDL	Method	Analysis Date
Antimony (0.006)	- - -	0.001	EPA 200.8	07/02/97	Nickel	- - -	0.001	EPA 200.8	07/02/97
Arsenic (0.05)	ND	0.005	EPA 200.8	07/02/97	Selenium (0.05)	ND	0.005	EPA 200.8	07/02/97
Barium (2)	0.009	0.01	EPA 200.8	07/02/97	Sodium	1.9	1	EPA 200.8	07/02/97
Beryllium (0.004)	- - -	0.001	EPA 200.8	07/02/97	Thallium (0.02)	- - -	0.001	EPA 200.8	07/02/97
Cadmium (0.005)	ND	0.001	EPA 200.8	07/02/97	Cyanide (0.2)	ND	0.01	EPA 200.8	07/02/97
Chromium (0.1)	0.002	0.005	EPA 200.8	07/02/97	Fluoride (4.0)	ND	0.1	EPA 300.0	06/27/97
Mercury (0.002)	ND	0.001	EPA 200.8	07/02/97					

SECONDARY CONTAMINANTS

Contaminant	Result	MDL	Method	Analysis Date	Contaminant	Result	MDL	Method	Analysis Date
Chloride	ND	0.001	EPA 300.0	06/26/97	Ammonia/N	ND	0.1	EPA 350.2	07/01/97
Color	4	0.005	EPA110.2	06/26/97	Calcium	4.2	1	EPA 200.8	07/02/97
Sulfide (HS)	ND	0.01	EPA 376.1	06/26/97	Hardness (CaCO3)	14	5	2340 B	07/02/97
Iron	0.15	0.05	EPA 236.1	07/02/97	Magnesium	0.7	1	EPA 200.8	07/02/97
Manganese	0.009	0.001	EPA 200.8	07/02/97	pH	- - -		EPA 150.1	
Odor	- - -	1	EPA 140.1		Potassium	0.07	1	EPA 200.8	07/02/97
Surfactants	ND	0.05	SM5540C	06/26/97	Silica (SiO3)	5	1	EPA 200.8	07/02/97
TDS	15	1	EPA 160.1	06/26/97	Lead	0.002	0.001	EPA 200.8	07/02/97
Zinc	0.006	0.001	EPA 200.8	07/02/97	Copper	0.016	0.001	EPA 200.8	07/02/97
Sulfate	ND	1	EPA 300.0	06/26/97	Conductivity (uS/cm)	27.2	10	EPA 120.1	06/25/97
Aluminum	- - -	0.001	EPA 200.8	07/02/97	Langlier Index	- - -			
Alkalinity	- - -	5	EPA 310.1		Silver	ND	0.01	EPA 200.8	07/02/97
Turbidity (NTU)	- - -	0.5	EPA 180.1						

Laboratory Reporting Codes:

Results are mg/L (ppm) unless otherwise noted

ND - Not detected within the sensitivity of the instrument

- - - = No analysis performed for this contaminant

Numerical Entry = Detection at level indicated

MCL (numbers in parenthesis)= EPA maximum contaminant level

Appendix C4. Red River adult holding pond water quality analysis report.  
Analysis done by Anatek Labs, Inc., Moscow, Idaho.

PRIMARY CONTAMINANTS

Contaminant	Result	MDL	Method	Analysis Date	Contaminant	Result	MDL	Method	Analysis Date
Antimony (0.006)	- - -	0.001	EPA 200.8	07/16/97	Nickel	- - -	0.001	EPA 200.8	07/16/97
Arsenic (0.05)	ND	0.005	EPA 200.8	07/16/97	Selenium (0.05)	ND	0.005	EPA 200.8	07/16/97
Barium (2)	0.03	0.01	EPA 200.8	07/16/97	Sodium	3.2	1	EPA 200.8	07/16/97
Beryllium (0.004)	- - -	0.001	EPA 200.8	07/16/97	Thallium (0.02)	- - -	0.001	EPA 200.8	07/16/97
Cadmium (0.005)	ND	0.001	EPA 200.8	07/16/97	Cyanide (0.2)	ND	0.01	EPA 200.8	07/16/97
Chromium (0.1)	0.001	0.005	EPA 200.8	07/16/97	Fluoride (4.0)	ND	0.1	EPA 300.0	07/03/97
Mercury (0.002)	ND	0.001	EPA 200.8	07/16/97	Nitrate /N	ND	0.5	EPA 300.0	07/03/97

SECONDARY CONTAMINANTS

Contaminant	Result	MDL	Method	Analysis Date	Contaminant	Result	MDL	Method	Analysis Date
Chloride	ND	0.001	EPA 300.0	07/03/97	Ammonia/N	ND	0.1	EPA 350.2	07/01/97
Color	15	0.005	EPA110.2	07/03/97	Calcium	3.92	1	EPA 200.8	07/16/97
Sulfide (HS)	ND	0.01	EPA 376.1		Hardness (CaCO3)	13	5	2340 B	07/16/97
Iron	0.37	0.05	EPA 236.1	07/16/97	Magnesium	0.76	1	EPA 200.8	07/16/97
Manganese	0.014	0.001	EPA 200.8	07/16/97	pH	7.06		EPA 150.1	07/03/97
Odor	- - -	1	EPA 140.1		Potassium	0.53	1	EPA 200.8	07/16/97
Surfactants	- - -	0.05	SM5540C		Silica (SiO3)	7.9	1	EPA 200.8	07/16/97
TDS	21	1	EPA 160.1	07/03/97	Lead	0.002	0.001	EPA 200.8	07/16/97
Zinc	0.016	0.001	EPA 200.8	07/16/97	Copper	0.016	0.001	EPA 200.8	07/16/97
Sulfate	ND	1	EPA 300.0	07/03/97	Conductivity (uS/cm)	32	10	EPA 120.1	07/03/97
Aluminum	- - -	0.001	EPA 200.8	07/16/97	Langlier Index	- - -			
Alkalinity	- - -	5	EPA 310.1		Silver	ND	0.01	EPA 200.8	07/16/97
Turbidity (NTU)	1.4	0.5	EPA 180.1	07/03/97					

Laboratory Reporting Codes:

Results are mg/L (ppm) unless otherwise noted

ND - Not detected within the sensitivity of the instrument

- - - = No analysis performed for this contaminant

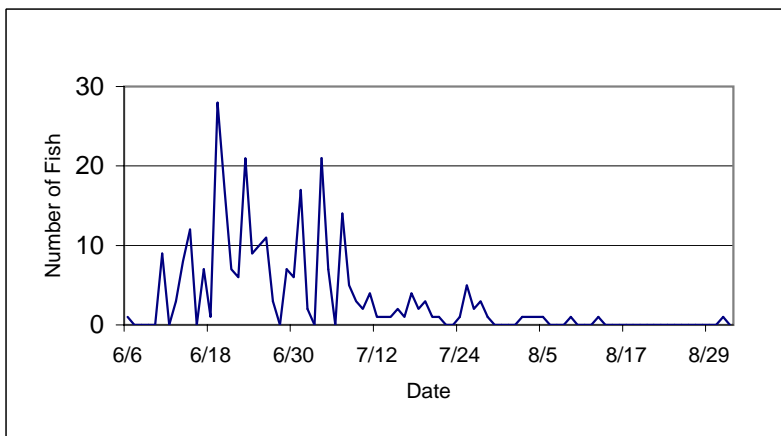
Numerical Entry = Detection at level indicated

MCL (numbers in parenthesis)= EPA maximum contaminant level

Appendix D1. Crooked River Run Timing, 1998

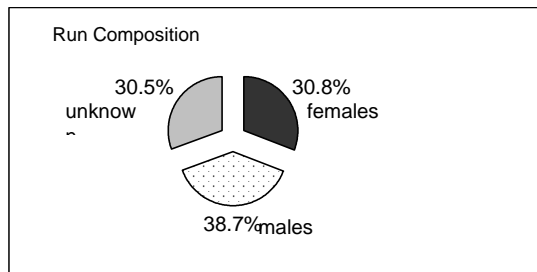
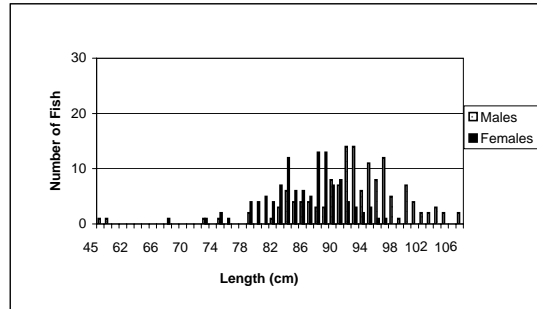
DATE	ADULT	DATE	ADULT
06/06	1	07/26	2
06/07	0	07/27	3
06/08	0	07/28	1
06/09	0	07/29	0
06/10	0	07/30	0
06/11	9	07/31	0
06/12	0	08/01	0
06/13	3	08/02	1
06/14	8	08/03	1
06/15	12	08/04	1
06/16	0	08/05	1
06/17	7	08/06	0
06/18	1	08/07	0
06/19	28	08/08	0
06/20	17	08/09	1
06/21	7	08/10	0
06/22	6	08/11	0
06/23	21	08/12	0
06/24	9	08/13	1
06/25	10	08/14	0
06/26	11	08/15	0
06/27	3	08/16	0
06/28	0	08/17	0
06/29	7	08/18	0
06/30	6	08/19	0
07/01	17	08/20	0
07/02	2	08/21	0
07/03	0	08/22	0
07/04	21	08/23	0
07/05	7	08/24	0
07/06	0	08/25	0
07/07	14	08/26	0
07/08	5	08/27	0
07/09	3	08/28	0
07/10	2	08/29	0
07/11	4	08/30	0
07/12	1	08/31	1
07/13	1	09/01	0
07/14	1	09/02	0
07/15	2	09/03	0
07/16	1		
07/17	4		
07/18	2		
07/19	3		
07/20	1		
07/21	1		
07/22	0		
07/23	0		
07/24	1		
07/25	5		

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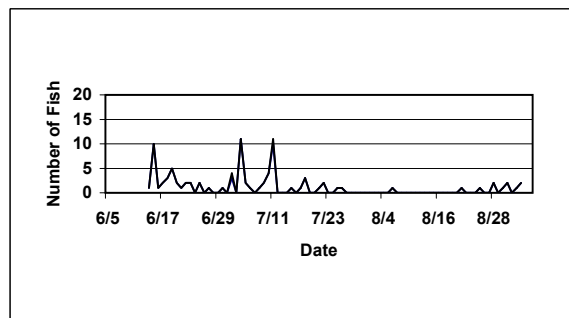
Appendix D2. South Fork (Red River/Crooked River) Length Frequency, 1998

Length (fk / cm)	Females	Males	Unknown	Total
45	0	1	0	1
58	0	1	0	1
60	0	0	0	0
61	0	0	0	0
62	0	0	0	0
63	0	0	0	0
64	0	0	1	1
65	0	0	1	1
66	0	0	0	0
67	1	0	1	2
68	0	0	1	1
69	0	0	2	2
70	0	0	1	1
71	0	0	1	1
72	1	1	2	4
73	0	0	1	1
74	2	1	0	3
75	1	0	1	2
76	0	0	2	2
77	0	0	0	0
78	4	2	0	6
79	4	0	1	5
80	5	0	2	7
81	4	1	1	6
82	7	3	3	13
83	12	6	2	20
84	6	4	8	18
85	6	4	9	19
86	5	4	4	13
87	13	3	7	23
88	13	3	8	24
89	7	8	4	19
90	8	7	7	22
91	4	14	3	21
92	3	14	4	21
93	2	6	9	17
94	3	11	5	19
95	1	8	7	16
96	1	12	6	19
97	0	5	0	5
98	0	1	3	4
99	0	7	3	10
100	0	4	2	6
101	0	2	0	2
102	0	2	0	2
103	0	3	0	3
104	0	2	0	2
105	0	0	0	0
106	0	2	0	2
	113	142	112	367



Appendix E.1. Red River Run Timing, 1998

DATE	ADULT	JACKS	TOTAL	DATE	ADULT	JACKS	TOTAL
6/14	1	0	1	7/26	1	0	1
6/15	10	0	10	7/27	0	0	0
6/16	1	0	1	7/28	0	0	0
6/17	2	0	2	7/29	0	0	0
6/18	3	0	3	7/30	0	0	0
6/19	5	0	5	7/31	0	0	0
6/20	2	0	2	8/1	0	0	0
6/21	1	0	1	8/2	0	0	0
6/22	2	0	2	8/3	0	0	0
6/23	2	0	2	8/4	0	0	0
6/24	0	0	0	8/5	0	0	0
6/25	2	0	2	8/6	1	0	1
6/26	0	0	0	8/7	0	0	0
6/27	1	0	1	8/8	0	0	0
6/28	0	0	0	8/9	0	0	0
6/29	0	0	0	8/10	0	0	0
6/30	1	0	1	8/11	0	0	0
7/1	0	0	0	8/12	0	0	0
7/2	3	1	4	8/13	0	0	0
7/3	0	0	0	8/14	0	0	0
7/4	11	0	11	8/15	0	0	0
7/5	2	0	2	8/16	0	0	0
7/6	1	0	1	8/17	0	0	0
7/7	0	0	0	8/18	0	0	0
7/8	1	0	1	8/19	0	0	0
7/9	2	0	2	8/20	0	0	0
7/10	4	0	4	8/21	1	0	1
7/11	10	1	11	8/22	0	0	0
7/12	0	0	0	8/23	0	0	0
7/13	0	0	0	8/24	0	0	0
7/14	0	0	0	8/25	1	0	1
7/15	1	0	1	8/26	0	0	0
7/16	0	0	0	8/27	0	0	0
7/17	1	0	1	8/28	2	0	2
7/18	3	0	3	8/29	0	0	0
7/19	0	0	0	8/30	1	0	1
7/20	0	0	0	8/31	2	0	2
7/21	1	0	1	9/1	0	0	0
7/22	2	0	2	9/2	1	0	1
7/23	0	0	0	9/3	2	0	2
7/24	0	0	0	<b>TOTAL</b>	<b>88</b>	<b>2</b>	<b>90</b>
7/25	1	0	1				



Appendix E2. South Fork Chinook summary of fish trapped, released, spawned, and disposition of carcasses, Brood Year 1998.

**TOTAL FISH TRAPPED: 367**

AGE CLASSES	FEMALES	MALES	UNKNOWN
3 Years = (<64 cm)	0	2	0
4 Years = (64 - 82 cm)	29	8	21
5 Years = (> 83 cm)	84	132	91
	113	142	112

FISH DISPOSITION FEMALES:

SPAWNED	84
MORTALITY	29
TOTAL	113

FISH DISPOSITION MALES:

SPAWNED	118
MORTALITY	21
TOTAL	139

RELEASED - UNKNOWN SEX

	RV	LV	NO MARK	TOTAL
RED RIVER	11	3	22	36
CROOKED RIVER	37	0	42	79
TOTAL	48	3	64	115

All spawning carcasses were put back in the river.

Appendix F1. Summary of spring chinook returns to Crooked River by brood year.										
Brood Year	Year Released	Number Released	3-yr-olds	Year Returned	4-yr-olds	Year Returned	5-yr-olds	Year Returned	Total by return	% return from plant
1985	-----	-----		1988	-----	1989	4	1990	4	
1986	-----	-----		1989	23	1990	5	1991	28	
1987	Spr 1989 (a)	199,700	2	1990	13	1991	7	1992	22	0.011%
1988	Spr 1990 (b)	300,407	2	1991	208	1992	276	1993	486	0.162%
1989	Fall 1990 (c)	339,087	13	1992	119	1993	10	1994	142	0.042%
1990	Fall 1991 (a)	320,400	7	1993	15	1994	0	1995	22	0.002%
1991	-----	-----	1*	1994	0	1995	1	1996	1	0.000%
1992	Spr 1994 (d)	273,766	6	1995	241 (g)	1996	59	1997	306	0.112%
1993	Fall 1994	199,255								
	Fall 1994 (e)	216,280	94 (g)	1996	935	1997	213	1998	1274	0.134%
	Spr 1995	258,293								
	Spr 1995 (f)	279,615								
		953,443								
1994	Spr 1996	37,071	2	1997	22	1998	3	1999	27	0.073%
1995	Spr 1997	0	0	1998	0	1999		2000		
1996	Spr 1998	205,906	122	1999		2000		2001		
1997	Fall 1998	162,119		2000		2001		2002		
	Spr 1999	600,981								
		763,100								
1998	Fall 1999	89,299		2001		2002		2003		
	Spr 2000	399,060								
		488,359								

(a) Transferred from Dworshak Hatchery

(b) Direct released from Kooskia Fish Hatchery

(c) Transferred from Dworshak and Rapid River hatcheries

(d) Eggs from Lookingglass Hatchery (Rapid River stock) reared at Clearwater Hatchery

(e) Eggs from Rapid River hatchery reared at Clearwater Hatchery

(f) Non-acclimated release

(g) These numbers do not match run report numbers. Each one has been corrected to reflect straying from other stocks.

\*Natural Fish.

Appendix F2. Summary of spring chinook returns to Red River by brood year.

Brood Year	Year Released	Number Released	3-yr-olds	Year Returned	4-yr-olds	Year Returned	5-yr-olds	Year Returned	Total by return	% return from plant
1982	Fall 1983 Spr 1984	260,000 40,000	2	1985	a	1986	107	1987	109	0.036%
1983	Spr 1985 (b)	80,000	a	1986	377	1987	259	1988	636	0.795%
1984	Spr 1986(b)	136,800	35	1987	132	1988	74	1989	241	0.176%
1985	Fall 1986(c) Spr 1987 (c)	96,400 96,800	3	1988	25	1989	13	1990	41	0.021%
1986	Fall 1987	233,100	5	1989	38	1990	8	1991	51	0.022%
1987	Fall 1988	291,200	2	1990	9	1991	3	1992	14	0.005%
1988	Fall 1989	240,500	1	1991	31	1992	39	1993	71	0.029%
1989	Fall 1990 Spr 1991 (d) Spr 1991(e)	273,800 63,000 124,000 <u>460,800</u>	5	1992	99	1993	13	1994	117	0.025%
1990	Fall 1991 Spr 1992 (f)	354,700 207,500 <u>562,200</u>	1	1993	18	1994	1	1995	20	0.004%
1991	Fall 1992	6,000		1994	0	1995	0	1996	0	0.000%
1992	Fall 1993	22,246	3	1995	4 (g)	1996	45	1997	52	0.234%
1993	Fall 1994	320,755	5	1996	191	1997	42	1998	238	0.074%
1994	Spr 1996	24,002	2	1997	25	1998	2	1999	29	0.121%
1995	Spr 1997	2,983	1	1998	6	1999		2000		
1996	Spr 1998	51,208	15	1999		2000		2001		
1997	Fall 1998 Spr 1999	66,114 360,983								
1998	Fall 1999 Spr 2000	74,981 159,051 <u>234,032</u>								

(a)Trap was not inst

(b)These fish wintered in the rearing pond.

(c)These fish were Rapid River stock reared at Sawtooth and released directly into Red River with no acclimation.

(d)Planted off bridge at ranger station, reared at Dworshak National Fish Hatchery, Clearwater Stock

(e)Planted off bridge at ranger station, reared at Kooskia, Clearwater stock.

(f)Acclimated in rearing pond for 21 days, transferred from Dworshak

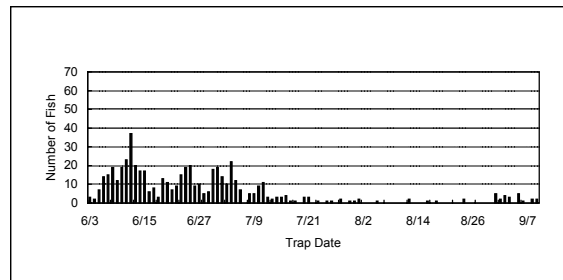
(g)These numbers do not match run report numbers. Each one has been corrected to reflect straying from other stocks.



Appendix G1. Powell and Crooked Fork Creek Run

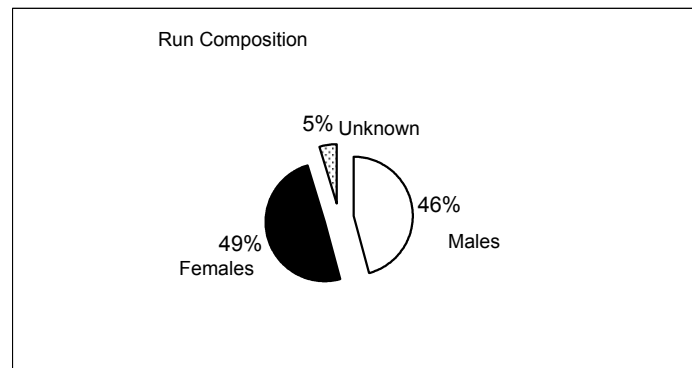
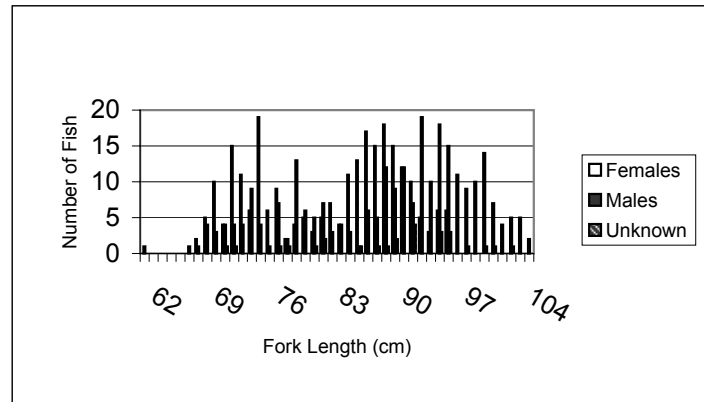
Timing 1998.

Date	Adults	Jacks	Total	Date	Adults	Jacks	Total
06/03	3		3	07/26	1		1
06/04	2		2	07/27	0		0
06/05	7		7	07/28	2		2
06/06	14		14	07/29	0		0
06/07	15		15	07/30	1		1
06/08	19		19	07/31	1		1
06/09	12		12	08/01	2		2
06/10	19		19	08/02	0		0
06/11	23		23	08/03	0		0
06/12	37		37	08/04	0		0
06/13	20		20	08/05	1		1
06/14	17		17	08/06	0		0
06/15	17		17	08/07	0		0
06/16	6		6	08/08	0		0
06/17	8		8	08/09	0		0
06/18	3		3	08/10	0		0
06/19	13		13	08/11	0		0
06/20	11		11	08/12	2		2
06/21	7		7	08/13	0		0
06/22	9		9	08/14	0		0
06/23	15		15	08/15	0		0
06/24	19		19	08/16	1		1
06/25	20		20	08/17	0		0
06/26	9		9	08/18	1		1
06/27	9	1	10	08/19	0		0
06/28	5		5	08/20	0		0
06/29	6		6	08/21	0		0
06/30	18		18	08/22	0		0
07/01	19		19	08/23	0		0
07/02	14		14	08/24	2		2
07/03	10		10	08/25	0		0
07/04	22		22	08/26	0		0
07/05	12		12	08/27	0		0
07/06	7		7	08/28	0		0
07/07	0		0	08/29	0		0
07/08	5		5	08/30	0		0
07/09	5		5	08/31	5		5
07/10	9		9	09/01	2		2
07/11	11		11	09/02	4		4
07/12	3		3	09/03	3		3
07/13	2		2	09/04	0		0
07/14	3		3	09/05	5		5
07/15	3		3	09/06	1		1
07/16	4		4	09/07	0		0
07/17	1		1	09/08	2		2
07/18	1		1	09/09	2		2
07/19	0		0		540	1	541
07/20	3		3				
07/21	3		3				
07/22	0		0				
07/23	1		1				
07/24	0		0				
07/25	1		1				



Appendix G2. Powell and Crooked Fork Creek Length Frequency, 1998

Length (fk / cm)	Females	Males	Unknown	Total
62	0	1	0	1
63	0	0	0	0
64	0	0	0	0
65	0	0	0	0
66	0	0	0	0
67	0	1	0	1
68	2	1	0	3
69	5	4	0	9
70	10	3	0	13
71	4	4	1	9
72	15	4	1	20
73	11	4	0	15
74	6	9	0	15
75	19	4	0	23
76	6	1	0	7
77	9	7	1	17
78	2	2	1	5
79	4	13	0	17
80	5	6	0	11
81	3	5	1	9
82	5	7	2	14
83	7	3	0	10
84	4	4	0	8
85	11	3	0	14
86	13	1	1	15
87	17	6	0	23
88	15	5	1	21
89	18	12	1	31
90	15	9	2	26
91	12	12	0	24
92	10	7	4	21
93	5	19	0	24
94	3	10	0	13
95	6	18	3	27
96	6	15	3	24
97	0	11	0	11
98	0	9	1	10
99	0	10	0	10
100	0	14	1	15
101	0	7	1	8
102	0	4	0	4
103	0	5	1	6
104	0	5	0	5
105	0	2	0	2
TOTAL	248	267	26	541



Appendix G3. Powell Chinook summary of fish trapped, released, spawned, and disposition of carcasses, Brood Year 1998.

**TOTAL FISH TRAPPED: 541\***

AGE CLASSES	FEMALES	MALES	UNKNOWN
3 Years = (<64 cm)	0	1	0
4 Years = (64 - 82 cm)	106	75	7
5 Years = (> 83 cm)	142	191	19
	248	267	26

\*This total includes 12 recaptured fish.

FISH DISPOSITION FEMALES:

SPAWNED	235
MORTALITY	18
TOTAL	253

FISH DISPOSITION MALES:

SPAWNED	235
MORTALITY	18
TOTAL	253

RELEASED - UNKNOWN SEX

RV	LV	TOTAL
22	21	43

All spawning carcasses were put back in the river.

Appendix H. Summary of spring chinook returns to Powell by brood year.

Brood	Year	Number		Year		Year		Year	Total by	% return
Year	Released	Released	3-yr-olds	Returned	4-yr-olds	Returned	5-yr-olds	Returned	return	from plant
1984	Spr 1986	-----		1987		1988	16	1989	16	
1985	Spr 1987	-----		1988	111	1989	20	1990	131	
1986	Spr 1988 (a)	200,100	27	1989	157	1990	10	1991	194	0.097%
1987	Spr 1989 (b)	200,639	2	1990	16	1991	15	1992	33	0.016%
1988	Fall 1989	314,500	7	1991	249	1992	288	1993	544	0.173%
1989	Fall 1990	307,100	6	1992	204	1993	57	1994	267	0.054%
	Spr 1991 (c)	180,764								
1990	Fall 1991	358,400	8	1993	28	1994	1	1995	37	0.007%
	Spr 1992 (d)	150,800								
	Spr 1992 (e)	<u>53,500</u>								
		562,700								
1991	Fall 1992 (f)	500	1	1994	1	1995	0	1996	2	0.400%
	Fall 1992 (g)									
1992	Spr 1994 (h)	144,823	12	1995	141	1996	129	1997	268	0.102%
	Spr 1994 (i)	61,060								
	Spr 1994 (j)	<u>55,745</u>								
		261,628								
1993	Fall 1994	311,690	45	1996	587	1997	310	1998	942	0.156%
	<u>Spr 1995</u>	<u>290,417</u>								
		602,107								
1994	Spr 1996	232,731	2	1997	177	1998	53	1999	232	0.099%
1995	Spr 1997	3,549	1	1998	8	1999		2000		
1996	Spr 1998	244,847	119	1999		2000		2001		
1997	Fall 1998	330,555		2000						
	<u>Spr 1999</u>	<u>334,482</u>								
		665,037								
1998	Spr 2000	293,522		2001						

(a) Rapid River stock reared at Dworshak

(b) Clearwater stock reared at Kooskia and Dworshak

(c) Clearwater stock reared at Kooskia; acclimated in rearing pond

(d) Acclimated 21 days in rearing pond before release into Walton Creek, transferred from Dworshak

(e) Not acclimated, transferred to rearing pond and immediately released

(f) These smolts were released from the rearing pond to Walton Creek

(g) Released at headwaters of Crooked Fork Creek

(h) Acclimated 17 days, volitional release 5 days, released in Walton Cr.

(i) Non-acclimated, transferred to rearing pond and immediately released.

(j) Released directly into Walton Creek

Appendix I. Clearwater Hatchery spring chinook egg inventory information, Brood Year 1998.  
Sources of eggs are shown.

**POWELL**

Spawn Date	Number Females Spawned	Number Males*	Number Females Culled	Number Production Females	Number Green Eggs	Number Eyed Eggs	Number Fish For Rearing	
8/3/98	7	7	1	6	31,228	28,759	28,759	
8/6/98	10	10	1	9	47,170	30,808	30,808	
8/10/98	20	20	6	14	65,016	46,785	46,785	
8/13/98	29	29	8	21	114,290	76,795	76,795	
8/17/98	51	51	10	41	192,732	151,214	151,214	
8/20/98	40	40	2	38	166,436	147,944	147,944	
8/24/98	49	49	7	42	191,517	161,490	161,490	
8/27/98	10	10	1	9	46,029	43,350	43,350	
8/31/98	3	3		3	14,920	13,177	13,177	
9/4/98	3	3		3	11,805	9,413	9,413	
9/8/98	4	4		4	16,850	14,250	14,250	
<b>TOTAL</b>	<b>226</b>	<b>226</b>	<b>36</b>	<b>190</b>	<b>897,993</b>	<b>723,985</b>	<b>723,985</b>	<b>80.6%</b>

Fecundity = 4,726 eggs/f

**SOUTH FORK**

Spawn Date	Number Females Spawned	Number Males *	Number Females Culled	Number Production Females	Number Green Eggs	Number Eyed Eggs	
8/11/98	1	2	0	1	5,371	1,780	
8/14/98	1	2	0	1	6,037	5,778	
8/18/98	3	6	0	3	16,561	14,183	
8/21/98	9	18	2	7	34,758	30,646	
8/25/98	25	50	8	17	89,371	77,717	
8/28/98	34	68	6	28	127,668	113,097	
9/1/98	4	8	0	4	20,582	15,787	
9/4/98	7	14	2	5	29,706	23,094	
<b>TOTAL</b>	<b>84</b>	<b>168</b>	<b>18</b>	<b>66</b>	<b>330,054</b>	<b>282,082</b>	<b>85.5%</b>

Fecundity = 5,001 eggs /f

Rapid River Received 510,226 HBKD

Dworshak Received 151,000 HBKD

\*Some males used more than once for spawning.

Appendix J. Clearwater Hatchery BY-98 spring chinook fish marking and distribution summary.

<b>Date Planted</b>	<b>Site</b>	<b>Brood Year</b>	<b>Length (inches)</b>	<b>Pounds</b>	<b>Number</b>	<b>Number /lb</b>	<b>Marks</b>
9/27/99	Red River	1998	4.9	3,206	74,981	23.0	All Lv
9/28/99	Crooked River	1998	4.7	3,307	89,299	27.0	All Rv
3/6/00	Rapid River	1998	5.5	30,729	462,949	15.1	All Ad clip only
4/10/00	Red River	1998	5.2	8,825	159,051	8.3	all Ad clip, 23K CWT
4/10/00	Crooked River	1998	5.0	9,188	180,170	15.5	all Ad clip, 22.5K CWT
4/10/00	Walton Creek	1998	5.4	9,541	147,538	19.6	all Ad clip, all CWT
4/10/00	Walton Creek	1998	6.7	17,484	145,984	18.0	all Ad clipped, all CWT
4/14/00	Crooked River	1998	5.1	11,527	215,890	18.7	all Ad clip
<b>TOTAL</b>			<b>5.3</b>	<b>93,807</b>	<b>1,475,862</b>	<b>15.7</b>	

Appendix K. Production cost for BY-98 Chinook and 1999 Steelhead

**REARING TO RELEASE**

	Chinook (BY-98)	North Fork Steelhead (BY-99)
Number Produced	1,475,862	735,266
Weight	93,807	153,257
% Mortality (from eyed eggs)	11.5%	12.5%
Conversion Rate	1.35	1.32

\*includes 43,087 steelhead transferred back to Dworshak on 8/3/99.

**FOOD FED AND WEIGHT GAINED**

	Chinook (BY-98)	North Fork Steelhead (BY-99)
Period Fed	Jan. 1999 - Apr. 2000	May 1999 - Apr. 2000
Feed Used Lbs.	127,644	204,104
Weight Gain	93,807	153,257

Feed Cost	<u>\$145,380.00</u>	<u>\$78,924.00</u>
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Total Feed Cost	\$224,304.00
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Average Cost per pound:	\$1.02 Chinook
	\$0.54 Steelhead

Appendix L1. Summary of Fish Autopsy, chinook fall 1999 release.

ACCESSION NO:	99-348	LOCATION:	Crooked River Satellite
SPECIES:	Chinook Spring	AUTOPSY DATE:	9/26/99
STRAIN:	SF CLW SC	AGE:	Juv
UNIT:	All ponds sampled	SAMPLE SIZE:	20
REASON FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson		
REMARKS:			

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	0	0	0
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	0	0	0

\*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

\*\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE																			
EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	0	0	20	N	20	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	20	1	0	S	0	B	0	1	0
B2	0	C	0	L	0	2	0	2	3	G	0	2	0	M	0	C	20	2	0
E1	0	M	0	S&L	0			3	7	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	10	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=3.35								OT	0		
M1	0																		
OT	0																		

SUMMARY OF NORMALS									
20	20	20	20	20	20	20	20	20	20
SEX	M: 0		F: 0		U: 0				

GENERAL REMARKS:

FINS: GOOD

GONADS:

SKIN:

OTHER:



Appendix L2. Summary of Autopsy, Crooked River chinook spring 2000 release.

ACCESSION NO:	00-71	LOCATION:	Crooked River Satellite
SPECIES:	Chinook Spring	AUTOPSY DATE:	04/03/00
STRAIN:	SF CLW SC	AGE:	Juv
UNIT:	All ponds sampled	SAMPLE SIZE:	20
REASON FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson		
REMARKS:			

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	45.35	11.2	.247
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	9.088	2.28	.251

\*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

\*\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	13	N	20	N	20	0	20	0	1	B	20	0	20	N	17	A	1	0	0
B1	7	F	0	S	0	1	0	1	6	R	0	1	0	S	3	B	17	1	0
B2	0	C	0	L	0	2	0	2	6	G	0	2	0	M	0	C	1	2	0
E1	0	M	0	S&L	0			3	7	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	0	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=1.95								OT	1		
M1	0																		
OT	0																		

SUMMARY OF NORMALS

	13	20	20	20	19	20	20	17	19	20
SEX		M: 0		F: 0		U: 0				

GENERAL REMARKS:

FINS: GOOD

GONADS:

SKIN: LOSING SCALES

OTHER:

Appendix L3. Summary of Fish Autopsy, Powell chinook spring 2000.

ACCESSION NO:	00-32	LOCATION:	Clearwater Hatchery
SPECIES:	Chinook Spring	AUTOPSY DATE:	03/02/00
STRAIN:	RRSC	AGE:	Juv
UNIT:	All ponds sampled	SAMPLE SIZE:	20
REASON FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson		
REMARKS:			

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	37.75	2.44	0.0648
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	7.75	1.099	1.4111

\*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

\*\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO- BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	20	0	20	N	20	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	0	1	0	S	0	B	14	1	0
B2	0	C	0	L	0	2	0	2	1	G	0	2	0	M	0	C	6	2	0
E1	0	M	0	S&L	0			3	9	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	10	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=3.45								OT	0		
M1	0																		
OT	0																		

SUMMARY OF NORMALS

20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
SEX		M: 0				F: 0				U: 0									

GENERAL REMARKS:

FINS: GOOD

GONADS:

SKIN:

OTHER:

Appendix L4. Summary of Fish Autopsy, Red River chinook fall 1999 release.

ACCESSION NO:	99-349	LOCATION:	Red River Satellite
SPECIES:	Chinook Spring	AUTOPSY DATE:	9/26/99
STRAIN:	SF CLW SC	AGE:	Juv
UNIT:	All ponds sampled	SAMPLE SIZE:	20
REASON FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson		
REMARKS:			

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	0	0	0
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	0	0	0

\*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

\*\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	0	0	20	N	20	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	20	1	0	S	0	B	4	1	0
B2	0	C	0	L	0	2	0	2	0	G	0	2	0	M	0	C	16	2	0
E1	0	M	0	S&L	0			3	0	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	20	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=4.0								OT	0		
M1	0																		
OT	0																		

SUMMARY OF NORMALS

20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
SEX		M: 0				F: 0				U: 0									

GENERAL REMARKS:

FINS: GOOD

GONADS:

SKIN:

OTHER:

Appendix L5. Summary of Fish Autopsy, Brood Year 1999 Red River chinook spring 2000 release.

ACCESSION NO:	00-32	LOCATION:	Clearwater Hatchery
SPECIES:	Chinook Spring	AUTOPSY DATE:	03/02/00
STRAIN:	RRSC	AGE:	Juv
UNIT:	All ponds sampled	SAMPLE SIZE:	20
REASON FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson		
REMARKS:			

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	37.75	2.44	0.0648
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	7.75	1.099	1.4111

\*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

\*\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO- BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	20	0	20	N	20	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	0	1	0	S	0	B	14	1	0
B2	0	C	0	L	0	2	0	2	1	G	0	2	0	M	0	C	6	2	0
E1	0	M	0	S&L	0			3	9	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	10	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=3.45								OT	0		
M1	0																		
OT	0																		

SUMMARY OF NORMALS

20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
SEX		M: 0				F: 0				U: 0									

GENERAL REMARKS:

FINS: GOOD

GONADS:

SKIN:

OTHER:

Appendix L6. Summary of Fish Autopsy, Rapid River High BKD chinook, spring 2000 release.

ACCESSION NO:	00-32	LOCATION:	Clearwater Hatchery
SPECIES:	Chinook Spring	AUTOPSY DATE:	03/02/00
STRAIN:	RRSC	AGE:	Juv
UNIT:	All ponds sampled	SAMPLE SIZE:	20
REASON FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson		
REMARKS:			

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	37.75	2.44	0.0648
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	7.75	1.099	1.4111

\*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

\*\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE																			
EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	20	0	20	N	20	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	0	1	0	S	0	B	14	1	0
B2	0	C	0	L	0	2	0	2	1	G	0	2	0	M	0	C	6	2	0
E1	0	M	0	S&L	0			3	9	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	10	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=3.45								OT	0		
M1	0																		
OT	0																		

SUMMARY OF NORMALS																			
	20		20		20		20		20		20		20		20		20		20
SEX			M: 0				F: 0				U: 0								

GENERAL REMARKS:	
FINS: GOOD	GONADS:
SKIN:	OTHER:

Appendix M. Brood Year 1999 Steelhead (B) eggs received from Dworshak National Fish Hatchery.

<b>Egg Take Number</b>	<b>Spawn Date</b>	<b>Eyed Egg Deliver Date</b>	<b>Number Eyed Eggs</b>	<b>Temperature Units</b>
6	03/09/99	03/25/99	176,700	350
7	03/16/99	04/02/99	239,000	374
8	03/23/99	04/08/99	208,500	352
9	03/30/99	04/16/99	265,000	374
		<b>TOTAL</b>	<b>889,200</b>	

Machine enumeration done at Dworshak National Fish Hatchery.

Brood Year 99 steelhead survival from eggs to released smolts.

<b>Stock</b>	<b>Number Eyed Eggs</b>	<b>Released Smolts</b>	<b>Percent Survival</b>
Dworshak	889,200	778,353	87.5
<b>Total</b>		<b>778,353*</b>	

\*includes 43,087 steelhead transferred back to Dworshak on 8/3/99

# Appendix N. Summary of Fish Autopsy, Brood Year 1999 Steelhead

ACCESSION NO:	00-73	LOCATION:	Clearwater Hatchery
SPECIES:	Steelhead Trout	AUTOPSY DATE:	04/05/00
STRAIN:	NF CLW STB	AGE:	Juv
UNIT:	All ponds sampled	SAMPLE SIZE:	20
REASON FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson		
REMARKS:			

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	0	0	0
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	0	0	0

\*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

\*\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

## VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	0	0	20	N	20	A	20	0	0
B1	0	F	0	S	0	1	0	1	0	R	20	1	0	S	0	B	0	1	0
B2	0	C	0	L	0	2	0	2	0	G	0	2	0	M	0	C	0	2	0
E1	0	M	0	S&L	0			3	0	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	20	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=4.0								OT	0		
M1	0																		
OT	0																		

## SUMMARY OF NORMALS

20	20	20	20	19	20	20	20	20	20
SEX	M: 0			F: 0		U: 0			

## GENERAL REMARKS:

FINS: GOOD

GONADS:

SKIN: LOSING  
SCALES

OTHER:

Appendix O. Brood Year 1999, North Fork steelhead marking and distribution

<b>Date Planted</b>	<b>Site</b>	<b>Brood Year</b>	<b>Length (inches)</b>	<b>Lbs</b>	<b>Number</b>	<b>Number /lb</b>	<b>Marks</b>
4/19/00	CLEAR CREEK	1999	8	38,893	183,857	4.9	All AD marked, 45,280 AD/LV & CWT, 300 PIT
4/19/00	S F CLEARWATER RIVER	1999	8	63,647	311,416	4.7	All AD marked, 65,255 AD/LV & CWT, 300 PIT
05/04/00	CROOKED RIVER	1999	9	21,578	100,331	4.8	300 PIT
05/04/00	RED RIVER	1999	8	29,139	139,662	4.6	300 PIT
<b>TOTALS</b>			<b>8.4</b>	<b>153,257</b>	<b>735,266</b>	<b>4.8</b>	



**Submitted by:**

Jerry McGehee  
Hatchery Manager

Brad George  
Assistant Hatchery Manager

**Approved by:**

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Virgil K. Moore, Chief  
Fisheries Bureau

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Tom Rogers  
Anadromous Fish Hatcheries Supervisor